Answer on question #61316, Physics / Mechanics | Relativity

Two 25.0 N weights are suspended at opposite end of a rope that passes over a light, frictionless pulley. The pulley is attached to a chain that goes to the ceiling.

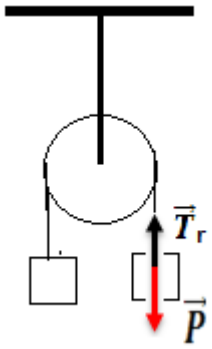
a. What is the tension in the rope?

b. What is the tension in the chain?

Solution:

The pulley has negligible mass. Let T_r be the tension in the rope and let T_c be the tension in the chain. P= 25.0 N

a) The diagram for the weight is given here



Write Newton's second law in the vector form:

$$\vec{F} = \vec{T_r} + \vec{P}$$

The equation will look like in the projection on the axis of +Y:

$$ma = T_r - P \ \ (where\ a = 0)$$

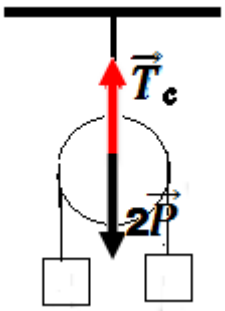
$$-T_r = -P\ (multiplied\ by\ -1)$$

$$T_r = P$$

$$T_r = 25.0\ N$$

As the rope will be stationary (same weight on the other side), therefore tension in the rope will be 25.0 N.

b) The diagram for the pulley is given here



Write Newton's second law in the vector form:

$$\vec{F} = \vec{T_c} + 2\vec{P}$$

The equation will look like in the projection on the axis of +Y:

$$ma = T_c - 2P \ \ (where\ a = 0)$$

$$-T_c = -2P$$

$$T_c = 2P$$

$$T_c = 2 \times 25.0\ N = 50.0\ N$$

Therefore, tension in chain= 50.0 N.

Answer: a) 25.0 N; b) 50.0 N